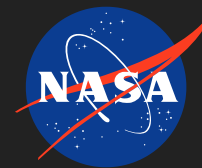


# Deployable Solar Array Structures with High Stowed Volume Efficiencies

Completed Technology Project (2017 - 2021)



## Project Introduction

**Objectives:** High stowed volume efficiencies for deployable solar array structures is a space mission enabling technology. Stowing large areas into tight volumes likely requires folding of such structures. Origami-based engineering is a recent field whose principles and methodology promise to provide solutions to this challenge. This leads to my hypothesis: Origami-based mechanisms, particularly novel methods included in my research, can be used to efficiently stow large-area structures into small volumes. Said efficiency is integral to the technology objectives and challenges of TABS element 3.1.3, Solar, and developing such origami-based deployable solar array structures with high stowed volume efficiencies is enabling to future NASA missions. **Methods:** To support and test my hypothesis that origami-based mechanisms with high stowed volume efficiencies can improve the technologies for space solar power generation, the following research objectives will be employed in the progression of my research: Identify and develop novel methods to fold thick-sheet or flexible blanket materials with high areal packaging densities and thus, high stowed volume efficiencies. Show that the folding of monolithic systems developed with my research for autonomous deployment can reduce mass. Analytically and experimentally show that these systems can meet the target goals of strength and stiffness. Develop reliably retractable solar array models. Demonstrate that these methods can contribute to mission-enabling technologies of NASA Technology Area 3: Space Power and Energy Storage by prototyping concept models which have low mass, low stowed volume, and high strength and stiffness. **Significance:** My research will assist in the mission enabling TABS elements, 3.1.3.1-4 of durably producing greater solar power with low mass (high specific power) and low stowed volume (high stowed volume efficiency) and reliable retraction of solar arrays. My proposed research will provide durable mass-reducing solar power production systems with high stowed volume efficiencies which will enable future NASA missions to Mars and beyond.

## Anticipated Benefits

My research will assist in the mission enabling TABS elements, 3.1.3.1-4 of durably producing greater solar power with low mass (high specific power) and low stowed volume (high stowed volume efficiency) and reliable retraction of solar arrays. My proposed research will provide durable mass-reducing solar power production systems with high stowed volume efficiencies which will enable future NASA missions to Mars and beyond.



Deployable Solar Array  
Structures with High Stowed  
Volume Efficiencies

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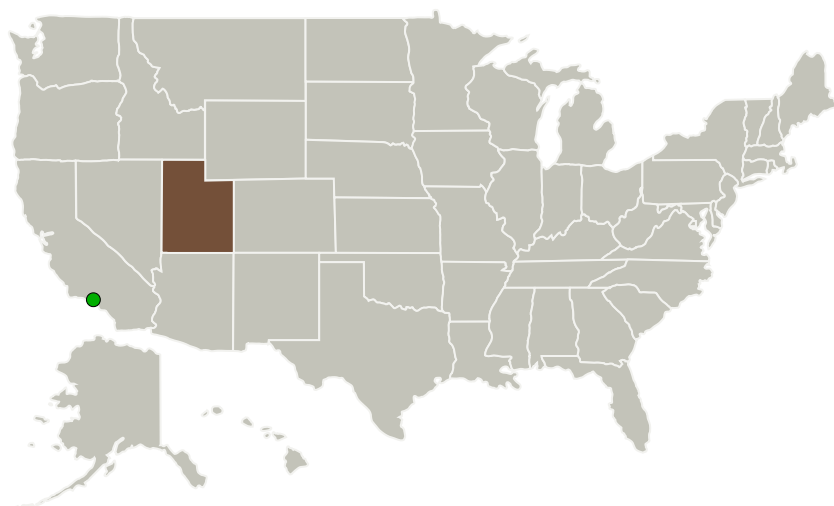
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## Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Brigham Young University-Provo	Lead Organization	Academia	Provo, Utah
 Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California

### Primary U.S. Work Locations

Utah

## Project Website:

<https://www.nasa.gov/strg#.VQb6T0jJzyE>

## Organizational Responsibility

### Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

### Lead Organization:

Brigham Young University-Provo

### Responsible Program:

Space Technology Research Grants

## Project Management

### Program Director:

Claudia M Meyer

### Program Manager:

Hung D Nguyen

### Principal Investigator:

Spencer Magleby

### Co-Investigator:

Nathan A Pehrson

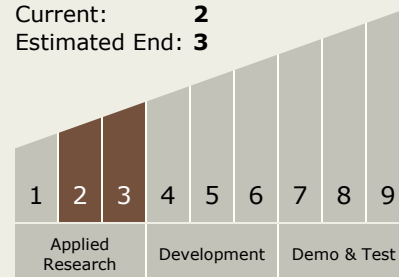
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Completed Technology Project (2017 - 2021)



## Technology Maturity (TRL)

Start: **2**  
Current: **2**  
Estimated End: **3**



## Technology Areas

### Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  - └ TX12.3 Mechanical Systems
    - └ TX12.3.1 Deployables, Docking, and Interfaces

## Target Destinations

Mars, Others Inside the Solar System